Claims

1. Device and process for generation of a partly synthesized
high-quality signal for acceleration of an armature of an
electric drive, characterized in that the rotary acceleration α
of the rotated armature or, in the case of a travelling wave
drive with armature set in linear movement, the linear
acceleration α of the armature set in linear movement, is
registered metrologically by an accelerometer mechanically
connected to this armature and preferably operating on the
Ferraris principle, or, in the case of a travelling wave drive
with armature set in linear movement by an accelerometer
preferably operating on the Ferraris principle transposed to
linear movement and is consequently available as measured
acceleration signal bm = α · Fg(p). Fg(p), with Fg(0) = 1, here
representing the so-called measurement transfer function, and in
that the torque m, or in the case of a travelling wave drive with
armature set in linear movement, the linear force f of the drive
hereinafter designated as substitute acceleration signal bE = m,
or in the case of a traveling wave drive with an armature set in
linear movement, designated as substitute acceleration signal bE
= f, is also registered metrologically and accordingly is
available as measured substitute acceleration signal bEm, it
being assumed thereafter, as is customary in automatic control
engineering, that on the one hand the measured acceleration
signal bm and on the other the measured substitute acceleration
signal bEm, all losses occurring in the drive in question being
disregarded and a mechanically absolutely rigid connection of the
surface of the armature rotated engaged by the torque to the
position of the rotated part of the rotary acceleration meter at
which the effect used for registration of acceleration is

generated being taken as a basis, or, in the case of a travelling wave drive with armature set in linear movement, a mechanically absolutely rigid connection from the surface of the armature set in linear movement which is engaged by the linear thrust of the drive to the position of the part of the linear accelerometer at which the effect used for registration of acceleration is registered, is each scaled so that the relation $bm = \alpha$ $Fg(p) = bEm$ $Fg(p)$ is satisfied, and characterized in that the measured acceleration signal bm is delivered to the input of a low-pass filter with the low-pass transfer function $FT(p)$, $FT(0)$ preferably equalling 1, so that the signal $x = bm$ $FT(p)$ can be received at the output of the low-pass filter, and in that the measured substitute acceleration signal bEm is delivered to the input of a high-pass filter with high-pass transfer function $FH(p) = FT(0) - FT(p)$ $Fg(p)$, and so the signal $y = bEm$ $[FT(0) - FT(p)$ $Fg(p)]$ may be received at this high-pass filter, and in that a signal $z = bm$ $FT(p)$ + bEm $[FT(0) - FT(p)$ $Fg(p)]$ is now formed in accordance with the relation $z = x + y$ and this synthesized signal z is subsequently used as a very high-quality dynamic substitute as the undelayed instantaneous value of the rotary acceleration α of the rotated armature in automatic control of the drive in question or, in the case of a travelling wave drive with armature set in linear movement, as a very high-quality dynamic substitute as the undelayed instantaneous value of the linear acceleration α of the armature set in linear movement in automatic control of the drive in question.

2. A device and a process as described in Claim 1, wherein the rotary acceleration α of the rotated armature of a rotary current drive is registered metrologically by an accelerometer mechanically connected to this armature and preferably operating

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on the Ferraris principle, and is consequently available as
measured acceleration signal bm = α · Fg(p). Fg(p), with Fg(0) =
1, here representing the so-called measurement transfer function,
and wherein the torque m, hereinafter designated as substitute
acceleration signal bE = m, is registered metrologically and
accordingly is available as measured substitute acceleration
signal bEm, it being assumed thereafter, as is customary in
automatic control engineering, that on the one hand the measured
acceleration signal bm and on the other the measured substitute
acceleration signal bEm, all losses occurring in the drive in
question being disregarded and a mechanically absolutely rigid
connection of the surface of the armature rotated engaged by the
torque to the position of the rotated part of the rotary
acceleration meter at which the effect used for registration of
acceleration is generated being taken as a basis, is each scaled
so that the relation bm = α · Fg(p) = bEm · Fg(p) is satisfied,
and wherein the measured acceleration signal bm is delivered to
the input of a low-pass filter with the low-pass transfer
function FT(p), FT(0) preferably equalling 1, so that the signal
x = bm · FT(p) can be received at the output of the low-pass
filter, and wherein the measured substitute acceleration signal
bEm is delivered to the input of a high-pass filter with high-
pass transfer function FH(p) = FT(0) · FT(p) · Fg(p), and so the
signal y = bEm · [FT(0) - FT(p) · Fg(p)] may be received at this
high-pass filter, and wherein a signal z = bm · FT(p) + bEm ·
[FT(0) - FT(p) · Fg(p)] is now formed in accordance with the
relation z = x + y and this synthesized signal is subsequently
used as a very high-quality dynamic substitute for the undelayed
instantaneous value of the rotary acceleration α of the rotated
armature in automatic control of the drive in question.

3.   A device and a process as described in Claim 2, wherein,
rather than the torque m of the drive, use is made of the
directly torque forming transverse-current component iq of the
current volume indicator of the winding fed by transverse current
of the drive substitute acceleration signal bE = iq.

4.   A device and a process as described in Claim 1, wherein
the linear acceleration α of an armature set in linear movement
of a travelling wave drive is registered metrologically by an
accelerometer preferably operating on the Ferraris principle
transposed to linear movement and is consequently available as
measured acceleration signal bm = α Fg(p), Fg(p), with Fg(0) =
1, representing the so-called measurement transfer function, and
wherein the linear force f of the drive with armature set in
linear movement, hereinafter designated as substitute
acceleration signal bE = f,   is also registered metrologically
and accordingly is available as measured substitute acceleration
signal bEm, it being assumed thereafter, as is customary in
automatic control engineering, that on the one hand the measured
acceleration signal bm and on the other the measured substitute
acceleration signal bEm, all losses occurring in the drive in
question being disregarded and a mechanically absolutely rigid
connection of the surface of the armature set in linear movement
engaged by the linear thrust to the position of the part of the
linear acceleration meter in linear movement at which the effect
used for registration of acceleration is generated being taken as
a basis, is each scaled so that the relation
bm = α Fg(p) = bEm   Fg(p) is satisfied, and wherein the
measured acceleration signal bm is delivered to the input of a
low-pass filter with the low-pass transfer function FT(p), FT(0)
preferably equalling 1,   so that the signal x = bm   FT(p) can be
received at the output of the low-pass filter, and wherein the

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measured substitute acceleration signal bEm is delivered to the
input of a high-pass filter with high-pass transfer function
FH(p) = FT(0) - FT(p)   Fg(p), and so the signal y = bEm
[FT(0) - FT(p)   Fg(p)] may be received at the output of this
high-pass filter, and wherein a signal z = bm   FT(p) + bEm
[FT(0) - FT(p)   Fg(p)] is now formed in accordance with the
relation z = x + y and this synthesized signal z is subsequently
used as a very high-quality dynamic substitute as the undelayed
instantaneous value of the linear acceleration α of the armature
in linear movement in automatic control of the drive in question.

    5.   A device and process as described in Claim 4, wherein
the transverse-current component iq directly forming the linear
force of the current volume indicator of the multiphase current-
fed winding of the drive is used as substitute acceleration
signal bE = iq in place of linear force f of the drive.

    6.   A device and a process as described in Claim 1, wherein
the rotary acceleration α of the rotated armature of a direct-
current drive is registered metrologically by an accelerometer
connected to this armature and preferably operating on the
Ferraris principle, and is consequently available as measured
acceleration signal bm = α Fg(p), Fg(p), with Fg(0) = 1, here
representing the so-called measurement transfer function of the
accelerometer, and wherein the torque m of the drive, hereafter
designated as substitute acceleration signal bE = m, is also
registered metrologically and accordingly is available as
measured substitute acceleration signal bEm, it being assumed
thereafter that on the one hand the measured acceleration signal
bm and on the other the measured substitute acceleration signal
bEm, all losses occurring in the drive in question being

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disregarded and a mechanically absolutely rigid connection of the
surface of the armature rotated engaged by the torque from the
position of the rotated part of the rotary acceleration meter at
which the rotary thrust of the drive is engaged to the position
of the rotated part of the accelerometer at which the effect used
for registration of acceleration is generated, basis, is each
scaled so that the relation $bm = \alpha$ $Fg(p) = bEm$ $Fg(p)$ is
satisfied, and wherein the measured acceleration signal bm is
delivered to the input of a low-pass filter with the low-pass
transfer function $FT(p)$, $FT(0)$ preferably equalling 1, so that
the signal $x = bm$ $FT(p)$ can be received at the output of the
low-pass filter, and wherein the measured substitute
acceleration signal bEm is delivered to the input of a high-pass
filter with high-pass transfer function $FH(p) = FT(0) - FT(p)$
$Fg(p)$, so that the signal $y = bEm$ $[FT(0) - FT(p)$ $Fg(p)]$ may
be received at the output of this high-pass filter, and wherein a
signal $z = bm$ $FT(p) + bEm$ $[FT(0) - FT(p)$ $Fg(p)]$ is formed
in accordance with the relation $z = x + y$ and this synthesized
signal z is subsequently used as a very high-quality dynamic
substitute as the undelayed instantaneous value of the rotary
acceleration α of the rotated armature in automatic control of
the drive in question.

    7. A device and a process as described in Claim 6, wherein
the armature current ia of the direct-current fed winding of the
drive is used as substitute acceleration signal $bE = ia$ in place
of the torque m of the drive.

    8. A device and a process as described in Claims 2 to 5,
wherein the limit frequency value selected for the low-pass
filter with low-pass transfer function $FT(p)$ is low enough so
that, if the drive winding is energized by multiphase current by

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way of a so-called pulse inverter and its output voltage space
indicator on the output side operates on the principle of
discrete-time change in switching condition control with a clock
frequency in the 100-kHz range directly from a two-point control
loop which adjusts the instantaneous value of the synthesized
signal z to the set value of this signal, then no self-excited
oscillations arise in this two-point control loop for the
synthesized signal z.

9. A device and a process as described in one of Claims 6 or
7, wherein the limit frequency value selected for the low-pass
filter with low-pass transfer function $FT(p)$ is low enough so
that, if the drive winding is energized by direct current by way
of a so-called pulse inverter and its output voltage is derived
in accordance with the principle of discrete-time change in
switching condition control with a clock frequency in the 100-kHz
range directly from a two-point control loop which adjusts the
instantaneous value of the synthesized signal z to the set value
of this signal, then no self-excited oscillations arise in this
two-point control loop for the synthesized signal z.

10. A device and a process as described in one of Claims 1
to 7, wherein the low-pass filter with low-pass transfer function
$FT(p)$ is dimensioned so that its limit frequency is lower than 10
kHz.

11. A device and a process as described in one of Claims 1
to 10, wherein the circumstance constantly occurring in practical
application that the connection between the measured substitute
acceleration signal bEm and the measured acceleration signal αm
is only incompletely described by the equation $\alpha m = Fg(p)$ bEm
and accordingly, in order for the actual conditions to be taken

into account is to be replaced by the relation $\alpha m = FM(p)$ $Fg(p)$
bEm, in which transfer function $FM(p)$ describes the mechanical
frequency response from the surface of the armature set in
movement which is engaged by the thrust of the drive to the
position of the part of the accelerometer set in movement at
which the effect used for registration of acceleration is
generated is taken into account by replacing the high-pass filter
in question with the high-pass transfer function $FH\ (p) = FT(0)$
$FT(p)$ $Fg(p)$ with a modified high-pass filter with modified
high-pass transfer function $Fh(p) = FT(0) - FT(p)$ $Fg(p)$
$FM(p)$, it being advisable in this process not to determine the
limit frequency of the low-pass filter with low-pass transfer
function $FT(p)$ until the high-pass filter with high-pass transfer
function $FH\ (p)$ has been replaced by a modified high-pass filter
with modified high-pass transfer function $Fh(p)$.

12. A device and a process as described in one of Claims 1
to 10, wherein the circumstance constantly occurring in practical
application that the connection between the measured substitute
acceleration signal bEm and the measured acceleration signal αm
is only incompletely described by the equation $\alpha m = Fg(p)$ bEm
and accordingly, in order for the actual conditions to be taken
into account, is to be replaced by the relation $\alpha m = FM(p)$
$Fg(p)$ $Fg(p)$ bEm, in which transfer function $FM(p)$ describes
the mechanical frequency response from the surface of the
armature set in movement which is engaged by the thrust of the
drive to the position of the part of the accelerometer set in
movement at which the effect used for registration of
acceleration is generated is taken into account in approximation

by separating from the transfer function in question FM(p) that
part

$$F_0(p) = \frac{(1+p \cdot T_\mu) \cdot (1+2 \cdot D_\nu \cdot p \cdot T_\nu + p^2 \cdot T_\nu^2) \cdot \ldots}{(1+p \cdot T_i) \cdot (1+2 \cdot D_j \cdot p \cdot T_j + p^2 \cdot T_j^2) \cdot \ldots},$$

which allows for one or more poles and/or zero positions with
particularly high values of $T\mu$, Tv, Ti, or Tj, and by replacing
te high-pass filter in question with high-pass transfer function
FH(p) = FT(0) - FT(p)   Fg(p) with a modified high-pass filter
with modified high-pass transfer function Fh*(p) $\simeq$ Fγ(0) - FT(p)
   F8(p)   F0(p), it being advisable not to determine the limit
frequency of the low-pass filter with low-pass transfer function
FT(p) in this process until the high-pass filter with high-pass
transfer function FH(p) has been replaced by a modified high-pass
filter with modified high-pass transfer function Fh*(p).

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